

WHAT WE CLAIM IS:

1. An oxynitride fluorescent material, which contains as a main component a crystal phase represented by a general formula $\text{La}_3\text{Si}_8\text{N}_{11}\text{O}_4$, with an optically active element (M) added thereto as a luminescence center.
2. The oxynitride fluorescent material according to claim 1, where said optically active element (M) comprises one or two or more elements selected from Mn, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
3. An oxynitride fluorescent material, which contains as a main component a crystal phase represented by a general formula $\text{La}_3\text{Si}_{8-x}\text{Al}_x\text{N}_{11-x}\text{O}_{4+x}$, where $0 < x \leq 4$, with an optically active element (M) added thereto as a luminescence center.
4. The oxynitride fluorescent material according to claim 3, wherein said optically active element (M) comprises one or two or more elements selected from Mn, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
5. The oxynitride fluorescent material according to claim 4, wherein x is $0 < x \leq 2$.
6. The oxynitride fluorescent material according to any one of claims 1 to 5, wherein at least Ce is contained as said optically active element (M).
7. The oxynitride fluorescent material according to any one of claims 1 to 7, wherein at least Tb is contained.
8. An oxynitride fluorescent material, which comprises an optically active element (M) and elements La,

Si, Al, N and O, where M is one or two or more elements selected from Mn, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu, has a compositional formula $M_aLa_bSi_cAl_dN_eO_f$ provided that $a+b=3$, and satisfies all conditions (i), (ii), (iii), (iv) and (v):

$$0.00001 \leq a \leq 2.5 \quad (i)$$

$$4 \leq c \leq 10 \quad (ii)$$

$$0 \leq d \leq 4 \quad (iii)$$

$$7 \leq e \leq 14 \quad (iv)$$

$$2 \leq f \leq 8 \quad (v)$$

9. The oxynitride fluorescent material according to claim 8, wherein $d=0$.

10. The oxynitride fluorescent material according to claim 8 or 9, wherein $c=8$, $e=11$, and $f=4$.

11. The oxynitride fluorescent material according to any one of claims 8 to 10, wherein Ce is selected as an M component.

12. The oxynitride fluorescent material according to any one of claims 8 to 10, wherein Tb is selected as said optically active element (M).

13. The oxynitride fluorescent material according to any one of claims 1 to 12, which comprises a mixture of a $La_3Si_8N_{11}O_4$ or $La_3Si_{8-x}Al_xN_{11-x}O_{4+x}$ crystal phase where $0 < x \leq 4$ with other crystal phase or an amorphous phase, and having a $La_3Si_8N_{11}O_4$ or $La_3Si_{8-x}Al_xN_{11-x}O_{4+x}$ crystal phase content of at least 50% by mass.

14. A lighting device comprising a light emission source and a fluorescent material, characterized by use of

at least a fluorescent material as recited in any one of claims 1 to 13.

15. The lighting device according to claim 14, wherein said light emission source is an LED emitting a 330 to 420-nm wavelength light.

16. The lighting device according to claim 14 or 16, wherein said light emission source is a 330 to 420-nm wavelength light emitting LED that is used in combination with a fluorescent material as recited in any one of claims 1 to 13, a green luminescent material that emits light having a wavelength of 520 nm to 570 nm inclusive in response to excitation light of 330 to 420 nm and a red fluorescent material that emits light of 570 nm to 700 nm inclusive in response to excitation light of 330 to 420 nm to mix together red light, green light and blue light, thereby emitting white light.

17. The lighting device according to claim 14 or 15, wherein said light emission source is a 330 to 420-nm wavelength light emitting LED that is used in combination with a fluorescent material as recited in any one of claims 1 to 13 and a yellow fluorescent material that emits light having a wavelength of 550 nm to 600 nm inclusive in response to excitation light of 330 to 420 nm to mix together yellow light and blue light, thereby emitting white light.

18. The lighting device according to claim 16, wherein said green fluorescent material is β -sialon with Eu in a solid solution form.

19. The lighting device according to claim 16, wherein said red fluorescent material is CaAlSiN_3 with Eu in a solid solution form.

20. The lighting device according to claim 17, wherein said yellow fluorescent material is Ca- α -sialon with Eu in a solid solution form.

21. An image display device comprising an excitation source and a fluorescent material, which uses at least a fluorescent material as recited in any one of claims 1 to 13.

22. The image display device according to claim 21, which is any one of a vacuum fluorescent display tube (VFD), a field emission panel (FED), a plasma display panel (PDP), and a cathode ray tube (CRT).